chemical properties expected of free fluorine. The compound now described is a fluorplumbate of the composition $3KF . HF . PbF_4$. It may be obtained by three methods. The first consists in treating the freshly precipitated hydrated oxide of lead, $Pb_5O_7 . 3H_2O$, a substance described by Dr. Brauner in the year 1885, with a mixture of hydrogen potassium fluoride and hydrofluoric acid. The fluorplumbate is separated from the lead difluoride simultaneously formed by crystallisation from hydrofluoric acid. The second method consists in substituting fluorine for oxygen in the plumbates of Fremy. Peroxide of lead and caustic potash, in the proportions of the compound $3KOH . PbO_2$, are fused in a silver crucible; the product is moistened with water, and then added gradually to excess of pure hydrofluoric acid. The filtered solution is evaporated to the crystallising point in a current of air, and as soon as crystals commence to form is placed in a vacuum desiccator. Crystals of the salt are then deposited. The third method consists in displacing the acetic acid in lead tetracetate by fluorine. One molecular equivalent of lead tetracetate is added to three equivalents of hydrogen potassium fluoride, $HF . KF$, dissolved in hydrofluoric acid; crystals of potassium fluorplumbate are formed upon evaporation, either in the air or *in vacuo*. Analyses of the crystals prepared by all three methods indicate the composition $3KF . HF . PbF_4$.

The needle-shaped crystals, which frequently attain the length of a centimetre, and are grouped radially, have been found to be in all probability monoclinic in symmetry, and isomorphous with the analogous fluorstannate described by Marignac.

Potassium fluorplumate is permanent in dry air, but becomes brown in moist air, being decomposed by water, with formation of hydrated peroxide of lead, hydrogen potassium fluoride, and free hydrofluoric acid. The effect of heat upon the salt is most interesting and important. The experiments should be carried out in a platinum tube. At 100°–110° the crystals remain unaltered. At 200° hydrogen fluoride commences to be evolved in small quantity. When subjected to a much higher temperature, after previous heating for several hours at 230°–250°, a gas commences to be evolved endowed with the odour ascribed by Moissan to fluorine. This occurs much below a red heat. The gas liberates iodine in such large quantities from iodised starch paper as to cause it to be deposited in crystals, and small crystals of silicon held in the open end of the tube not only burn with a vivid incandescence, but even with explosive violence. There can, therefore, be no question that the gas is free fluorine, and it would thus appear that Dr. Brauner has discovered a trustworthy purely chemical process of isolating the element. Potassium fluorplumbate loses its hydrogen fluoride almost completely at 230°, without losing more than a trace of fluorine from the lead tetrafluoride. Any small traces of hydrogen fluoride subsequently evolved along with the fluorine at the higher temperature may be readily removed by Moissan's method of passing the gas over potassium fluoride.

Dr. Brauner has already obtained evidence of the existence of a whole series of fluorplumbates, analogous to Marignac's fluorstannates, and is now engaged in studying the sodium salt.

A. E. TUTTON.

A SURVEY OF THE ENGLISH LAKES.

AT the last meeting of the Royal Geographical Society a paper was read by Dr. Hugh Robert Mill, on the Lake District of North-western England, of which the following is an abstract:—The lake district is a remarkably definite and symmetrical geographical unit. It may be roughly described as a circular mass of elevated land, highest in the centre, and furrowed by a series of valleys running from the centre toward the circumference like the spokes of a wheel. Most of these valleys contain long narrow lakes of considerable size, and of a different type from the small round mountain tarns which also occur in the district.

An account was given in the paper of the methods employed for ascertaining the depth and fixing the position of each sounding, and for mapping the resulting information. The lakes considered were Windermere, Ullswater, Coniston Water, Wastwater, Ennerdale Water, Buttermere and Crummock Water, Derwentwater, Bassenthwaite Lake, and Haweswater, each of which was found to have certain special characteristics which distinguished it from all the others. The soundings were carried out by the author, assisted by Mr. E. Heawood, Mr. Shields, and others.

There are two main types amongst these lakes, the shallow and the deep. The former, including only Derwentwater and Bassenthwaite, are the broadest of all the lakes; they average 18 feet in depth, their mean depth being only 25 per cent. of the maximum depth, a smaller ratio than for any other lakes. The bed of these lakes may be roughly described as an undulating plain, grooved and ridged into shallow hollows, and low shoals running parallel to the long axis of the lake. The configuration suggests that they may have been shallowed by glacial accumulations.

The second, or deep type, the shallowest of which has an average depth of 40 feet, and in which the average depth varies from 36 to 61 per cent. of the maximum depth, comprises all the other lakes except, possibly, Ennerdale, which combines the characteristics of both types. They are long, narrow, sometimes winding like Ullswater, or slightly curved in outline like Wastwater and Haweswater. The most characteristic lie in long narrow valleys with steeply sloping sides, and the slopes are continued under water with almost equal steepness, in some cases with greater steepness, and terminate in a nearly flat floor. The typical form of this class of lake is thus a steep-sided flat-bottomed trough, diversified along the slopes by the still steeper conical mounds of débris thrown down at the mouths of streams. In Haweswater the largest example of a delta occurs, nearly cutting the lake in two; while Buttermere and Crummock, lying in one uniform valley, are entirely separated, probably by the same action, and Derwentwater is also divided from Bassenthwaite by a broad alluvial plain. Although most of the lakes show only one clearly defined trough, the two largest are divided into distinct basins. In Windermere, the shoal on which Belle-isle and the other islands off Bowness, rise separates the deep and wide upper basin from the less deep and much narrower lower basin. In Ullswater each of the three reaches of the lake contains a definite basin separated from the others by broad or narrow bars. From one of these the island of Householm rises, a mass of strongly glaciated rock; but while the position of the basin to the south of it seems to confirm the glacial theory of the excavation of the hollow, the hollow to the north of the island is so situated as to make its origin by glaciation somewhat difficult to understand.

Three of the lakes have depths which descend below sea-level. In Wastwater 217 acres lie beneath sea-level, so that if drained to that extent it would present the appearance of a lake still 58 feet in depth at one point. Windermere, if similarly drained, would show a northern lake 3¼ miles long with a maximum depth of 90 feet, and 3 miles further south a narrower lake 1 mile in length and only 14 feet deep at its deepest, while south of this there would be a still shallower lagoon half a mile long. In Coniston reduced to sea-level there would probably appear one narrow lake 2½ miles long and 42 feet in maximum depths. All the other lakes are situated at such elevations that they do not approach sea-level in their greatest depths.

Altogether, the lakes which have been sounded and mapped cover an area of 20 square miles of unexplored territory. Contoured maps of the ten lake-basins under consideration have been supplied to the Ordnance Survey for incorporation on the official maps of the country.

THE RECENT DISCOVERY OF FOSSIL REMAINS AT LAKE CALABONNA, SOUTH AUSTRALIA.[1]

I.

FROM time to time notices have appeared of a remarkable discovery of fossil bones at Lake Mulligan in the interior of South Australia, but so far there has been no connected statement of what has been done in the way of developing the discovery. For reasons which will be evident, it is not yet possible to announce the results with anything more than a rough approximation, which leaves many interesting questions unsolved, or even untouched. Still, in view of its palæontological importance, it seems desirable that any available information should be given without further delay.

Necessarily a fragmentary and imperfect record, I trust the following account will, at least, afford evidence that the authorities of the South Australian Museum are fully alive to the interest of the issues involved, and that, so far as their not too ample means will allow, they are doing their best to prosecute successfully a work of some magnitude and difficulty.

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[1] By Dr. E. C. Stirling, F.R.S., C.M.G., Hon. Director, South Australian Museum.

One other preliminary statement seems necessary. Though the so called lake in which the fossils were found has been hitherto spoken of as Lake Mulligan, that name has never been officially conferred or recognised, and indeed it will not be found on any of the maps of South Australia. There prevails a very proper sentiment, unfortunately not always carried into action, that the native names of localities should, so far as possible, be retained. In this particular instance the euphonious native name Callabonna, which applies to a large water-course leading into the lake and to an adjoining sheep-run seemed appropriate in all respects, save that the association of sound and idea might erroneously suggest the possession of the scenic beauties of an Italian lake by an area which is not only waterless, but also almost unsurpassable for barrenness and utter desolation. The name, however, has been approved by the Executive, and in future the locality will be known as Lake Callabonna, and will be so called in the following notes:—

PHYSICAL FEATURES OF THE LAKE EYRE BASIN.

As has often been observed, those who might form their estimate of the physical geography of South Australia from an inspection of its maps alone, would come to very erroneous conclusions. The numerous, and often immense, areas marked as lakes, and the plentiful streams which appear to supply them, deserve their names on rare occasions only. Ordinarily the lakes are only shallow, mud-bottomed, or salt-encrusted clay-pans, and the rivers dry water-courses, or it may even be that a definite channel is unrecognisable. Only after the heavy tropical rains, which at too rare intervals descend to these latitudes, do the rivers run for a brief period and the lakes contain water, though for some time afterwards the deeper parts of the water-courses may remain as water-holes, or chains of water-holes of greater or less size and permanence. Those, however, who have only seen the river channels dry, can have little idea of what torrents they may become under such circumstances. The flood waters of the Barcoo or Cooper, some few years ago, spread over a breadth of from forty to fifty miles on its way to reach Lake Eyre. Lake Eyre itself has occasionally been filled, and is then a vast inland sea over a hundred miles long and fifty broad, and, when full of water, might well have suggested great possibilities of internal navigation.

The area of these inland lakes presents roughly a division into a Western system, comprising Lake Gairdner and numerous adjacent smaller clay-pans; a Central system, of which Lake Eyre, Lake Eyre South, and Lake Torrens are the chief members; and an Eastern system, comprising, in their order from north to south, Lakes Gregory, Blanche, Callabonna and Frome. These three systems have no direct communication with one another; in fact, they are separated by more or less elevated ground.

From the fact of some of the early explorers, in proceeding northwards, having struck the apparently unending margins and impassable beds of the huge clay-pans, either of Lake Torrens, of Lake Eyre, or of those of the Eastern group, all of them were for some time supposed to be continuous and to form one great lacustrine surface. Indeed, for many years a familiar feature on the maps of Australia was an immense crescentic, or horse-shoe shaped, area with its two horns, formed by the present Lakes Torrens and Frome, directed southwards. Eventually the progress of discovery enabled this horse-shoe to be broken up into the constituents now called Lakes Torrens, Eyre, Gregory, Blanche and Frome, as they now appear. It is easy to see, on reference to the map, how great the chances were that explorers, having once passed into the then unknown region enclosed within the concavity of this great system of clay-pans, should have had their further progress checked at the shores of one or other of them.

The constituents of the Eastern system, with which we are more immediately concerned, form a chain of clay-pans connected by intervening channels, and together they present a curve with its concavity directed towards the west. The whole of the series is, according to the most recent maps, included between the meridians of longitude 138° 50′ and 140° 20′ East of Greenwich, and the parallels of south latitude 31° 12′ and 28° 50′.

On those rare occasions when the flood waters of the Barcoo come down in sufficient volume, from the immense area which it drains in Southern Queensland, they pass into the Strzelecki, a large effluent which leaves the main channel at Innamincka, a place of melancholy memory in the history of Australian discovery, as close by the present settlement lie the remains of the ill-fated Burke, who perished in 1861 after a successful transit of Australia. These floods may then fill Lakes Gregory and Blanche; the latter lake, indeed, was filled two years ago, when its waters remained fresh for six months. A channel from the Strzelecki leads into Lake Callabonna, and I am informed that this depression also was filled from the same source some years ago, a statement which is supported by the presence upon the sand-hills of numerous fragments of the eggs of fresh-water fowl and of bones of water-rats. On the older maps Lake Callabonna was depicted as a northerly extension of Lake Frome, and indeed these two are actually connected by a channel, but whether water has ever been known to flow from one into the other I have not been able to learn.

There is compensation for the unpromising physical features of Lake Callabonna, that will be afterwards described, in the fact that its bed has lately been shown to be a veritable necropolis of gigantic extinct Marsupials and Birds, which have apparently died where they lie, literally in hundreds. The facts that the bones of individuals are often unbroken, close together and frequently in their proper relative positions, the attitude of many of the bodies, and the character of the matrix in which they are embedded, negative any theory that they have been carried thither by floods. The probability is rather that they met their death by being entombed in the effort to reach food or water, just as even now happens in dry seasons to hundreds of cattle which, exhausted by want of food, are unable to extricate themselves from the boggy places that they have entered in pursuit either of water or of the little green herbage due to its presence. The accumulation of so many bodies in one locality points to the fact of their assemblage around one of the last remaining cases in the region of desiccation which succeeded an antecedent condition of plenteous rains and abundant waters. An identical explanation has been suggested by Mr. Daintree in his notes on the Geology of Queensland (*Journal Geol. Soc.* 1872, p. 275).

LAKE CALLABONNA.

Lake Callabonna, the description of which is, in its main features, applicable to its kindred clay-pans, has a length of over fifty miles. About ten miles wide at its northern extremity it narrows to four or five at the site of the recent excavations, which is some fifteen miles to the southward, and becomes still further constricted in the remainder. Its shores, especially on the eastern side, are as yet imperfectly surveyed, nor have, I believe, any levels been taken of its bed. Possibly, like Lake Eyre, it may actually be below the sea level, but in any case it is relatively low lying, for water-courses lead into it on three sides. The Mount Hopeless, Yerila, Woratchie, Hamilton, Parabarana, and Pepegoona Creeks, all of which rise in the Flinders Range, enter it on the western side, and the Callabonna and Yandama Creeks, rising in the Grey Range, on the east. Though these only run after heavy rain, they may then bring down a considerable quantity of flood water. As I have already stated, water can flow into it at the northern end by the Moppa-Collina Channel which communicates with the Strzelecki. The occasional character of the surrounding country may be best appreciated by reference to some of the names given by the early explorers and settlers, such as Mount Hopeless, Dreary Point, Illusion Plains, Mount Deception, Mirage Creek, which tell their own story of drought, difficulties, and disappointments.

Speaking generally, the bed of the lake is a great flat clay-pan, depressed, but very little, below the surrounding country. In the neighbourhood of the fossiliferous area, however, this prevailing flatness is broken by the existence of an aggregation of dunes or hillocks of fine drift sand, not exceeding thirty feet in height, and with the ridges running more or less north and south at right angles to the direction of the prevalent westerly winds. These dunes are so far discontinuous that, did the lake contain a very few feet of water, they would be converted into a number of irregularly-shaped sand islets. From a foot to eighteen inches below their surface is a layer of loosely compacted sand rock in which were found the bivalve *Corbicula desolata*, Tate, now living in the Cooper River system, and the univalve *Blanfordia stirlingi*, Tate, not yet known to be living, though related to the common littoral species *B. striatula*.

The sand-dune area is about four miles long from north t south, and about three miles wide. The camp of the working party was at first pitched on the east side of the most southerly hillock, but the extreme exposure of the site to the prevalent winds and sand-storms soon compelled a change to the opposite side. Northward of the sand-hills, so far as the eye can reach, the whole lake bed is an unbroken flat expanse, covered with gypsum crystals of all sizes, from which the reflection of the bright sunlight causes a glare painful to the eyes. The greatest distance in this direction reached by members of the party was eight miles. Here there are a number of brackish springs in the bed of the lake, each surrounded by a fringe of "bull-rushes" (*Typha* sp.), and on the way thither a peculiar oval mound was passed, consisting of an interior mass of soft black mud covered by a greyish crust, the whole structure quaking on pressure like a jelly. The size was about twelve feet long by eight feet broad and four feet high.

South of the camp is another flat expanse on which water very readily collects even after a light fall of rain. When this is dry the surface is white from the presence of a saline efflorescence, probably sulphate of sodium. East and west the group of sand-hills are separated from the mainland by salt-encrusted flats of about half a mile in width, which in dry weather are passable for camels and even for light vehicles, but are extraordinarily boggy and sticky after rain.

There are a few shallow water-courses near the camp, the general direction of which is from north to south, and in some parts of these salt water stands permanently. The soft black mud which forms their bed contains in many places much decomposing vegetable matter, and often stinks horribly from the evolution from it of sulphuretted hydrogen gas. In one place there is, in the bed of the water-course, a round black-looking hole standing full of water, which gave no bottom with soundings at twenty-five feet.

After a continuance of dry weather, the flats around the camp become coated with a white amorphous saline crust with this peculiarity, that it does not form on surface tracks, and these thus appearing dark amid the surrounding white ground, the scene suggests with singular force the appearance of footprints on a snow-field. On the other hand, whenever water (collected in the tracks and other indentations) has evaporated, which very soon takes place under the influence of the strong, dry winds of the locality, there are left behind large flat glistening prismatic crystals which, in excess of dryness, crumble into a fine white powder. Unfortunately, the nature of these crystals cannot now be precisely stated, as the samples collected have not reached Adelaide, but, from their shape and behaviour, there is little doubt but that they are composed of sodium sulphate.

Scarcely any vegetation relieves the prevailing desolation beyond stubbly "samphire plants" (*Salicornia*), which grow in patches upon the sand-hills, and rarely exceed two feet in height. Judging by the unusual thickness of their stems, some of these bushes must be very old. A few scattered and still more stunted bushes of the same plant grow upon the intervening flats. To the north and south of the sand-hills not a bush relieves the unbroken monotony of the level, white crystalline surface.

On the western side, not far from the margin of the lake, are the Mulligan Springs, where a station hut was formerly in occupation; but this has been for some time abandoned. The adjacent country is now under pastoral lease to the Beltana Pastoral Company, whose holding extends continuously to the westward for a distance of 150 miles. The eastern spurs of the Flinders Range, the highest summits of which reach an elevation exceeding 3000 feet, approach to within about twenty miles of the lake, and at Paralana, on the eastern slope of the range, there are hot springs. Callabonna Station, belonging to Messrs. Ragless Brothers, borders the lake on the east, and consists chiefly of sandy plains which stretch to, and beyond, the boundary of New South Wales. The station-house stands on Callabonna Creek, about four miles from the lake, and six from the camp. Further south is the Muloowurtina Station, belonging to Mr. D. McCallum. The distance from Adelaide in a direct line is about 400 miles, but to reach the lake by the ordinary routes necessitates a journey by rail of about that length and an additional 150 to 200 miles by road, according to the route selected. The whole journey thither occupies five to six days, or longer in bad seasons.

Such are the physical characters of this uninviting region; its geological features will be afterwards considered.

HISTORY OF THE DISCOVERY.

During many years, and from many parts of South Australia, notably from the Lake Eyre district, the South Australian Museum has from time to time received teeth and fragments of *Diprotodon* bones, which were occasionally associated with fragmentary remains of Macropods, Crocodiles, Turtles, and large Birds.

Among such donations were some teeth and portions of the lower jaw, sent to us in 1885 by Mr. John Ragless, which were found by his son, Mr. F. B. Ragless, in a water-course at a depth of five feet, about two miles east of the margin of Lake Callabonna, and about twelve miles north-east of the place where the more recent discoveries have been made. It was not, however, until 1889 that the Museum obtained a very perfect skull, and several other bones in their entirety, from Baldina Creek, near Burra, a locality about a hundred miles due north of Adelaide. In the same year, from fragments found at Bundey, in the same district, we were able to restore incompletely another skull, which differs very considerably from the former. A little later a third, but more imperfect, skull was found at Gawler, twenty-five miles north of Adelaide.

Since the first discovery of *Diprotodon* remains in the Wellington Caves, by Sir Thomas Mitchell, in 1830, teeth and bones of this animal have been found over an extensive area which extends from the Gulf of Carpentaria to Victoria, and from the Darling Downs to the Lake Eyre Basin. They have also been found at Kimberley, in North-west Australia, and to the west of the head of the Great Bight; so that the *Diprotodon* appears to have had an immense range, and probably wandered over the whole continent of Australia.

The existence of bones in the actual bed of Lake Callabonna was made known to Mr. F. B. Ragless on January 10, 1892, by an intelligent aboriginal who described them as being very large and numerous, and two days afterwards Mr. Ragless himself visited the locality, which subsequently became the seat of operations. A few days later the place was visited by John Meldrum, who had been for some months in Mr. Ragless's employ, and by him some fragments were brought to Adelaide. These facts having come to the notice of the Museum authorities, Mr. H. Hurst, who had been previously engaged in geological and palæontological work in Queensland, was commissioned to inspect and report. The promising nature of the report of this gentleman ultimately led to the despatch to the lake of a party under his charge in January 1893.

THE WORK AT LAKE CALLABONNA.

Operations under Mr. Hurst's superintendence were continued for four months, during which time a considerable amount of material was obtained. Towards the end of June 1893, however, work, having been previously interrupted by rain, had to be finally discontinued in consequence of a heavy fall, and Mr. Hurst, with one of his party, returned to Adelaide, bringing with him as many bones as could be carried in a "buck-board" buggy.

At this stage it appeared desirable for various reasons that the work of excavation should be continued under the direction of a responsible Museum officer, and accordingly, at the desire of the Board of Management, I left for the field on August 11, 1893, in company with Mr. Zietz, the assistant director, and another member of the Museum staff. On our arrival at Lake Callabonna Mr. Hurst, who had by that time returned to the camp, resigned his appointment, with another member of his previous party.

As the result of Mr. Hurst's labours about a ton of bones were soon despatched to Adelaide. Shortly after our arrival a fall of rain, though not exceeding half an inch in amount, was sufficient to cause considerable sheets of water to collect on the low-lying flats, to fill up the holes which had been excavated, and to render the clay surface of the lake, at the best of times very soft and sticky, so boggy that further work on the field became for a time impossible. Further, it became a matter of great difficulty for the camels to pass over to the mainland for the requisite supplies, and it was occasionally necessary to remove their loads and dig them out of the glue-like mud in which they had sunk nearly to their bellies.

In consequence of the rain it was a fortnight before excavations could be properly resumed; meanwhile, being unfortunately obliged to return to Adelaide, I left the camp in charge of Mr. Zietz, the other members of the party being three assistants, a cook, and two Afghans in charge of five camels. The absence of all feed near the camp rendered it necessary that these latter should have their encampment on the eastern shore, at a distance of about two miles and a half.

The number of the party thenceforth remained unchanged.

Without the camels, which were lent to us by the liberality of the South Australian Government, it would have been quite impossible to carry on the work. By them meat, which sometimes went bad before the day was out, had to be brought a distance of six miles from Callabonna Station, as well as water from the same place, until, with the advance of summer the station supply fell short, when it became necessary to send to a well at a still greater distance, and every stick of firewood had to be fetched several miles. From the ravages of rabbits, of which there will be more to say directly, it was difficult to keep the camels in sufficiently good condition for their work, and each journey for wood and water generally required two days.

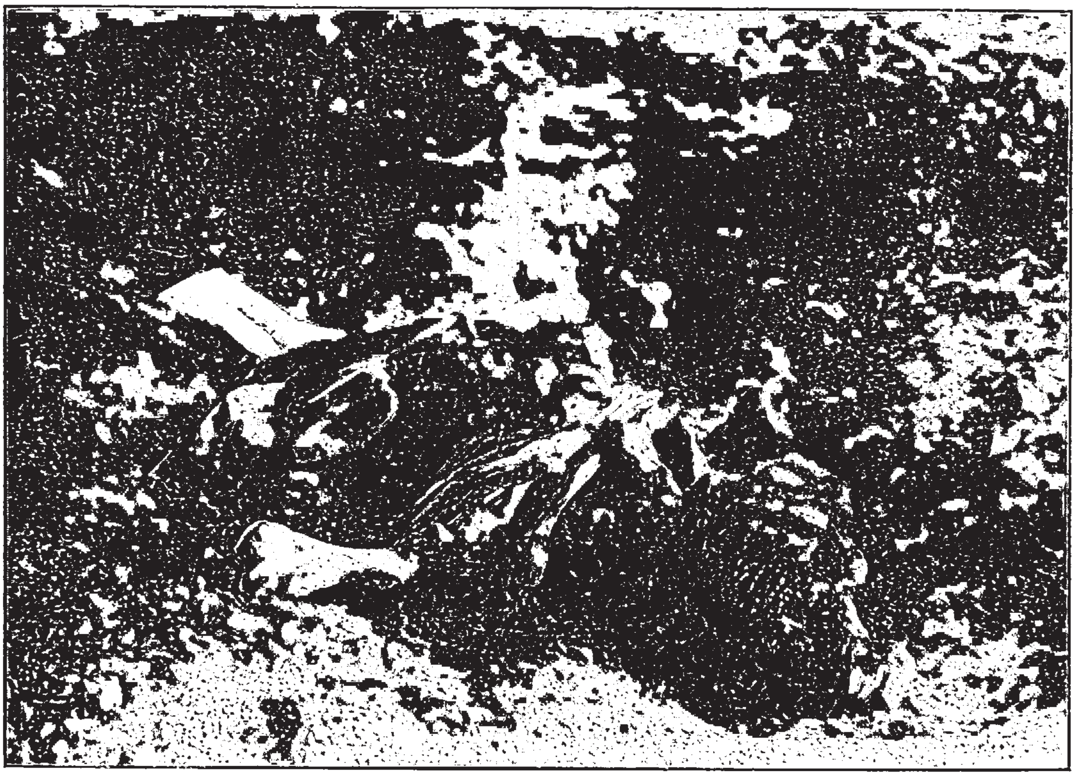

Fig. 1.—Diprotodon skeleton partially excavated.

When in the course of a fortnight after the rain, the ground had sufficiently dried to permit of the excavations being resumed, operations were commenced by Mr. Zietz at a place about a mile north-west of the camp from which his predecessor, Mr. Hurst, had obtained a number of bones. The subsequent yield, however, was inconsiderable in quantity, and such as were found were much broken and decomposed. They represented, however, a variety of species, odd bones of large and small Diprotodons, of the giant Wombat (*Phascolomys*), of Kangaroos, and of Birds being mixed together in great confusion; or it might be that the bones apparently of a single Diprotodon, even in previously unopened ground, were widely separated and broken, the fractures being sharp, and the missing pieces not discoverable.

This locality was consequently abandoned in favour of parts nearer the camp; from these good results were continuously obtained, and among them one apparently complete, and one nearly complete Diprotodon skeleton (Fig. 1), which were found in ground that had been tramped over hundreds of times in going to and fro between the camp and the more distant workings. Here also the remains of four birds were found lying close together. It may be mentioned that underground bones were usually discovered by probing with a wire rod, the sense of touch easily detecting the impact even with those that were soft.

Character of Lake Bed.

The Lake bed in the fossiliferous area adjacent to the camp comprises what appears to be one of its most low-lying parts. Its superstratum is a layer of stiff yellowish clay of variable depth, but usually of not less than about a foot in thickness, not of uniform character, but marked by streaks or veins of a rusty colour, containing much fine, sharp sand, due apparently to surface cracks having been filled up with drift-sand. In some places this veining is so irregular and contorted as to give the clay a marbled appearance. On drying, the clay separates readily, along these streaks, into quadrangular or polygonal masses somewhat after the manner of coal.

Beneath this superstratum is a layer of unctuous blue clay, of about two feet in thickness, resting upon a band of coarse sharp sand, beneath which no bones were ever found by Mr. Zietz. Below the sand the same blue clay occurs again for an undetermined depth, and shows in parts a laminated structure, with salt water lying in the interlaminar spaces. The greatest depth actually reached was between six and seven feet.

On physical analysis this clay yielded 15–20 per cent. of fine, sharp quartz-sand, while an approximate chemical analysis, kindly made for me by Mr. Turner, Demonstrator of Chemistry in the University, yielded the following results:—

Water	13	per cent.
Silica	40	,,
Calcium carbonate	8·5	,,
Alumina and iron	11·3	,,
Magnesia	1·5	,,
Alkaline chlorides and sulphates (mainly sodium sulphate)	25·7	,,
Total	100·0	,,

In the dry state numerous minute crystals of sulphate of calcium were visible in the clay.

In the least low-lying parts of the area salt water is reached at from two feet and a half to three feet; in the most depressed it remained permanently on the surface during the whole period of the excavations, which extended over the dry months of August, September, October, and November. In parts which are neither the highest nor the lowest the surface clay remains merely damp, and it was in ground of this character that the bones in best condition were found, provided that the underlying water did not approach the surface too nearly. In such cases, and in the very low places where the water remained permanently on the surface, it was impossible to excavate on account of the excessive inflow into the holes.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Sir Henry W. Acland, Bart., and Prof. J. S. Burdon Sanderson have been appointed representatives of the University at the eighth International Congress of Hygiene and Demography, to be held at Buda-Pesth in September.

The Sixth Annual Report of the Delegates of the University Museum has been published, and gives evidence of steadily increasing activity in the scientific work of the University. With increasing activity increased wants are felt, and the Regius Professor of Medicine, the Professor of Experimental Philosophy, and the Hope Professor of Zoology state that extra space is required for particular subjects required to be taught or exhibited in their departments. The reports of the Linacre Professor, and of the Curator of the Pitt Rivers Museum, contain long lists of specimens which have been added by gift, purchase, or exchange to the collections under their care, and one of the most satisfactory features of the report is the statement of the various researches which have been carried out in different laboratories during the past year.

CAMBRIDGE.—In addition to the honorary doctor's degrees to be conferred in connection with the visit of the Royal Agricultural Society to Cambridge, the honorary degree of M.A. will be conferred on June 27 on Mr. Ernest Clarke, secretary, and Dr. J. A. Voelcker, consulting chemist, to the Society.

Mr. A. E. Shipley, of Christ's College, has been appointed University Lecturer in the Advanced Morphology of the Invertebrata for five years from Michaelmas 1894, in the room of Prof. S. J. Hickson.

Mr. S. Ruhemann, of Gonville and Caius College, has been reappointed University Lecturer in Organic Chemistry for five years from Michaelmas 1894.

Mr. J. J. Lister, of St. John's College, has been appointed University Demonstrator of Comparative Anatomy.

At St. John's College the following awards in Natural Science were announced on June 18:—

Foundation Scholarships assigned or continued: W. L. Brown (Physiology); W. McDougall (Physiology and Anatomy); S. S. F. Blackman (Zoology); W. C. Brown, Butler, Orton, and R. J. Horton-Smith (subjects of Natural Sciences Tripos, Part I.); V. H. Blackman, Northcott, Tollent, West (second year subjects); Hemmy, Morgan (first year subjects). Hutchinson Studentship (for research in Pathology): F. Villy. Hughes Prize (third year): S. S. F. Blackman. Wright's Prizes: Tallent (second year), Hemmy (first year). Herschel Prize (for Astronomy), Fearnley.

SCIENTIFIC SERIALS.

The American Meteorological Journal for June contains a summary of an interesting article by Dr. F. Umlauft, on the names of the winds, originally published in the *Deutsche Rundschau für Geographie und Statistik* (vol. xvi. No. 3). The winds are mostly named according to the regions from which they come; thus winds blowing from land to sea are called land-breezes, and *vice versa*. The original names of the east and west points of the compass, and of the winds from those points, were derived from words connected with the appearance and disappearance of daylight; the names of north and south were principally associated with the kinds of weather that came from those points. Other names for the winds are associated with certain definite characteristics. In some places, on lakes, the winds are termed lower or upper winds, according to whether they originate at the lower or upper end of the lake; on the lake of Garda the upper wind is called *Sopero*, from the Italian *Sopra*, on the lake of Geneva; the wind coming down from the Vaud country is known as *Vaudaire*; and in the Rhine valley, the breeze blowing from the Wisp Valley is called *Wisperwind*. The Italians call their north-east wind *Greco*, and the Romans called the south-west wind *Africus*, while the Italians still call it *Affrico*. Homer names four winds only: Boreas, the north wind coming from Northern Greece; Zephyros, the west wind, from the word meaning darkness; Euros, indicating light, means a wind from the east; and Notos, from the word *Notios*, wet, a south wind in Greece. Winds are further named according to their influences and effects for good or evil; in Switzerland and the Tyrol the warm wind which melts the snow is known as *Aperwind*; while *Bise, Bis* or *Beiss* are the names given to the cold north wind; and *Maestro*, or master-wind, is the name given to the north-west wind which prevails in summer over the Adriatic; in France the word becomes *Mistral*, and it is a destructive wind. The word *Samoom*, given to the destructive desert wind of Arabia, is derived from the Arabic word *Ssim*, poison. For further particulars we refer our readers to the original article, which has also been reprinted in the *Meteorologische Zeitschrift* for January last.

Wiedemann's Annalen der Physik und Chemie, No. 6.—On the radiation of gases, by F. Paschen. The long-wave spectrum of water vapour and the absorption spectrum of liquid water is here dealt with. Rubens's latest re-determinations of the dispersion curve of fluorspar show that all the author's wave-lengths above 2·6 μ, based upon Rubens' and Snow's previous results, are untrustworthy. The author deals fully with Pringsheim's criticism of his work.—On some methods of determining the pitches of high notes, by F. Melde (see p. 155).—On the relation between the lowering of the freezing-point of solutions and their osmotic pressures, by C. Dieterici. The author works out an equation by which the osmotic work may be calculated from the depression of the freezing point, even in cases where the latter amounts to 50° C.—On the absorption of hydrogen by water and aqueous solutions, by Paul Steiner. The coefficients of absorption may be roughly divided into two groups—those of solutions of monad salts, of K, Li, and Na, and those of dyad salts, such as K_2CO_3, $CaCl_2$, Na_2SO_4. The curves exhibiting the relation between absorption and concentration form two bunches for the two groups. The curve for sugar solution is approximately a straight line, intersecting the curves of the second group.—On the electric conductivity of some salts dissolved in ethyl and methyl alcohol, by B. Völlmer. The molecular conductivities of the electrolytes tested in the alcohol increase as the concentration decreases. With extreme dilution they approach a limiting value, except those of $CaCl_2$ and CaN_2O_6 in ethyl alcohol. The conductivity also decreases as the molecular weight of the solvent increases.—On the similarity of the light emitted by an after-glowing Geissler tube and the beginning of the glow of solid bodies, by Carl Kirn. The spectrum of the after-glow contracted into a space between the wave-lengths of 555 and 495 $\mu\mu$, and appeared greyish-yellow. This is in accordance with Weber's observation, who noticed that a solid does not begin to glow red, but that the first colour to appear is a greenish-yellow band in the region of maximum luminosity of the solar spectrum.—On the electric and magnetic forces of the atoms, by F. Richarz.—On the forms of motion upon which electromagnetic phenomena may be based, by Hermann Ebert.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 24.—"On the Measurement of the Magnetic Properties of Iron." By Thomas Gray, Professor of Dynamic Engineering, The Rose Polytechnic Institute, Terre Haute, Indiana.

This paper gives the results of a continuation of the investigation which formed the subject of a paper communicated to the Royal Society in 1892, and published in the *Philosophical Transactions*, vol. clxxxiv. A. pp. 531–542. The results now given